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THE CHECKOUT AND MAINTENANCE (CAM) TRAINER

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FOREWORD

This report represents a portion of the applied research program conducted under Task 171004, "Techniques for Training, Aiding and Evaluating the Performance of Technical Tasks," of Project 1710, "Training, Personnel and Psychological Stress Aspects of Bioastronautics." Dr. Gordon A. Eckstrand was the Project Scientist. Dr. Ross L. Morgan was the Task Scientist.

The Checkout and Maintenance (CAM) Trainer, described in this report was developed under Contract AF 33(616)-7584 with Lockheed Electronics Company. Mr. Paul R. Richard and Mr. John L. Moss were Senior Engineer and Technician, respectively, for the design and fabrication of the device. Dr. John A. Modrick and Mr. Robert M. Jayson of the Training Research Division were Technical Monitors of the contract and were primarily responsible for the initial planning of the device.

The author wishes to acknowledge his appreciation to Dr. Gordon Eckstrand and Dr. Ross L. Morgan for their technical guidance in the preparation of the present report.

ABSTRACT

The Checkout and Maintenance (CAM) Trainer is a major device that has been specially constructed for research on electronic maintenance. The device has been designed to support research on problems such as the following: determining the major sources of difficulty in electronic maintenance; specifying the most efficient techniques and devices for training and aiding electronic maintenance personnel; and developing effective techniques for evaluating the proficiency of personnel performing electronic maintenance.

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In addition to its other uses, the device offers considerable potential as a controlled criterion task for a variety of studies of factors associated with electronics maintenance. For example, it can be used as an intermediate criterion against which to validate teaching methods, courses of instruction, electronics aptitude test scores, etc., or in the assessment of skill transfer between electronic systems.

The major components of the CAM Trainer are an AN/ASB-4 radar system, a student console for presenting instructional material to the subject, and an experimenter's station for overall control of the student console and data recording. A malfunction generator capable of inserting controlled, realistic malfunctions into the ASB-4 system for troubleshooting research is now being added to the CAM Trainer. The ASB-4 radar system functions realistically. Its operation is controlled by an AN/APQ T1 trainer and special electronic interconnecting equipment which provides signals to make the radar system function as it would on board an aircraft.

When used in training research, the basic operations of the CAM Trainer are as follows:

(1). The experimenter at the experimenter's station (Figures 6, 9, 10) determines the conditions of training for the subject.

(2). Instructions to the subject are presented on a rear projection screen on the student console at the right of the ASB-4 (Figures 6, 7, 8). These instructions are in two parts. The first part of the instructions tells the subject what he is to do and the second part tells him how to do it. The first part, presented in the large window at the top of the console, is called the "stimulus." The second part, presented in one of the smaller windows making up the major area of the console, is referred to as the "response."

(3). The student studies the materials presented to him and selects a response appropriate to the stimulus presented. His response is indicated to be either correct or incorrect by a light signal. He then may (or may not) be required to perform the verbally stated response item on the ASB-4.

(4). The student's responses at the console, time to choose a response, time spent in performing at the ASB-4, and various other time measures are recorded on a Clary time-data printer (Figure 9) at the experimenter's station.

The photographs on the following pages show the working environment and the overall configuration of the CAM Trainer (Figures 1 through 5), and the major components of the Trainer (Figures 6 through 15).

Figures 1 through 4 are photographs of a model of the CAM Trainer.

Figure 5 is an artist's conception of the Trainer. They are used here because they show the overall layout of the Trainer more effectively than would photographs of the actual equipment. Figures 6 through 15 are, however, photographs of the actual equipment.

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Figure 1. Floor plan model of CAM Trainer research facility. The large console in the left middle ground is the AN/APQ-T1 trainer, which simulates the aircraft environment so that the ASB-4 radar functions as it would in an aircraft.

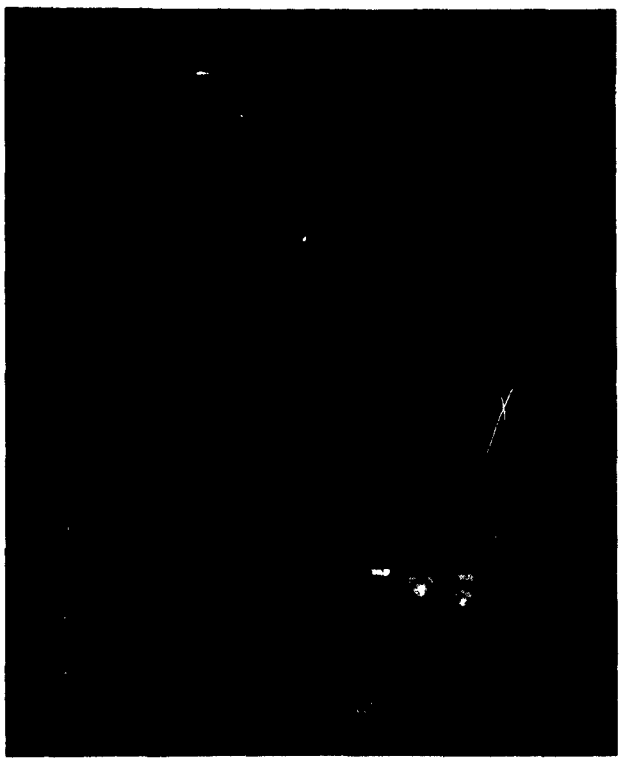


Figure 2

Floor plan model of CAM Trainer Research Facility, showing experimental area at far right.

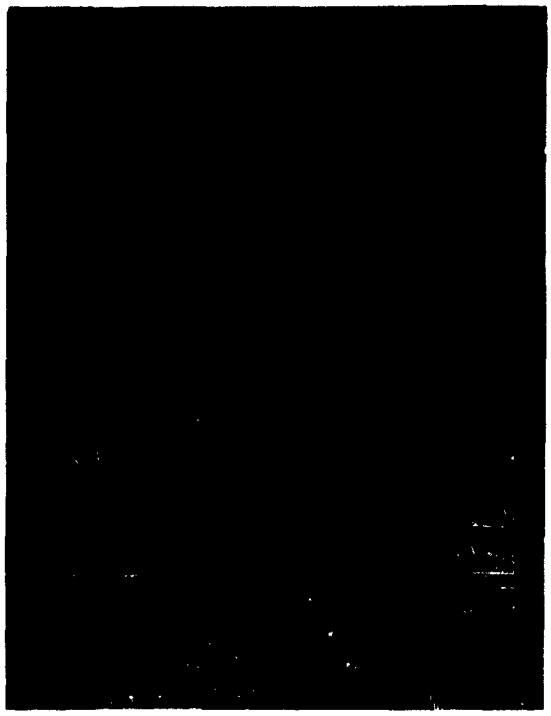


Figure 3. (left)

Close-up of CAM area, showing student's station at the top right of the picture and the instructor's station at the middle right.

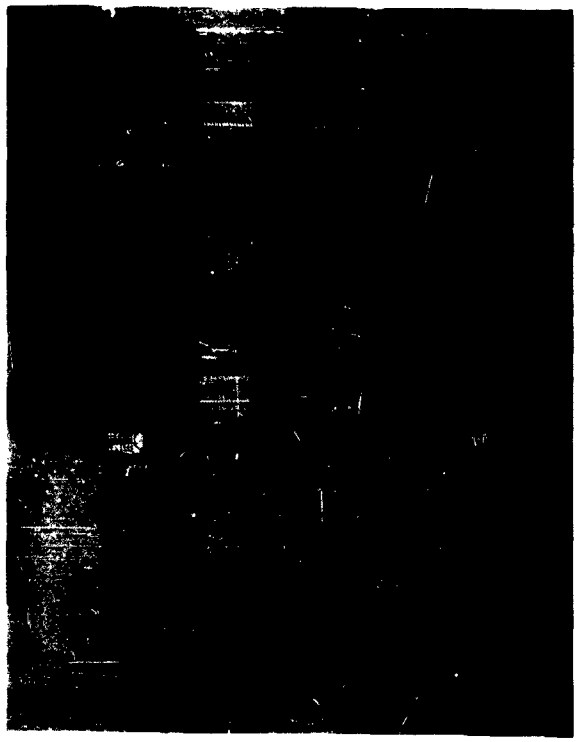


Figure 4 (right)

Close-up of autoinstruction lab. This lab is used to provide supplemental and/or additional methods and techniques for training subjects for complex maintenance tasks.

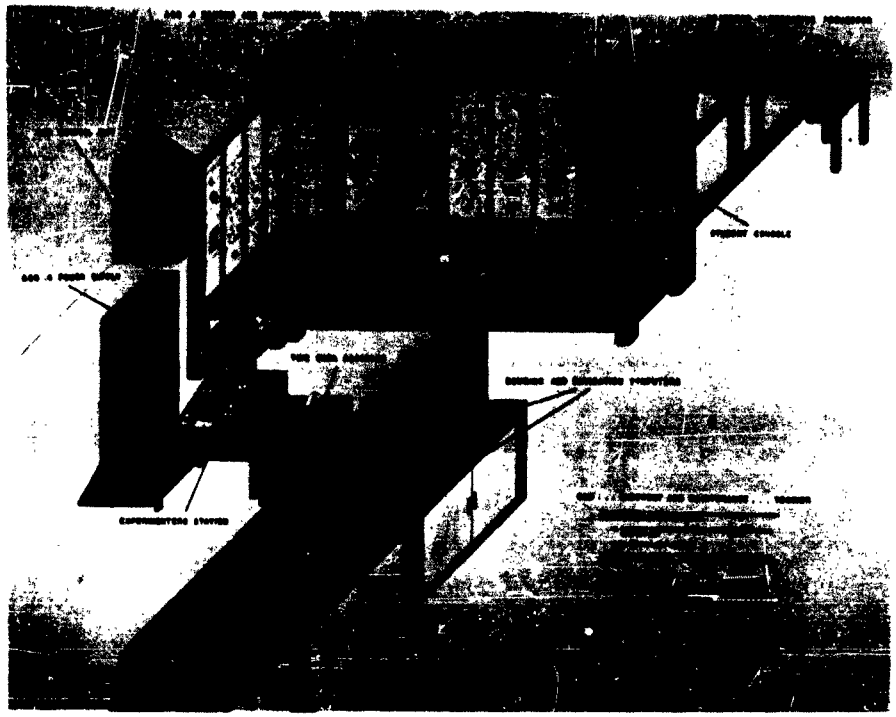


Figure 5. Artist's conception of the CAM Trainer

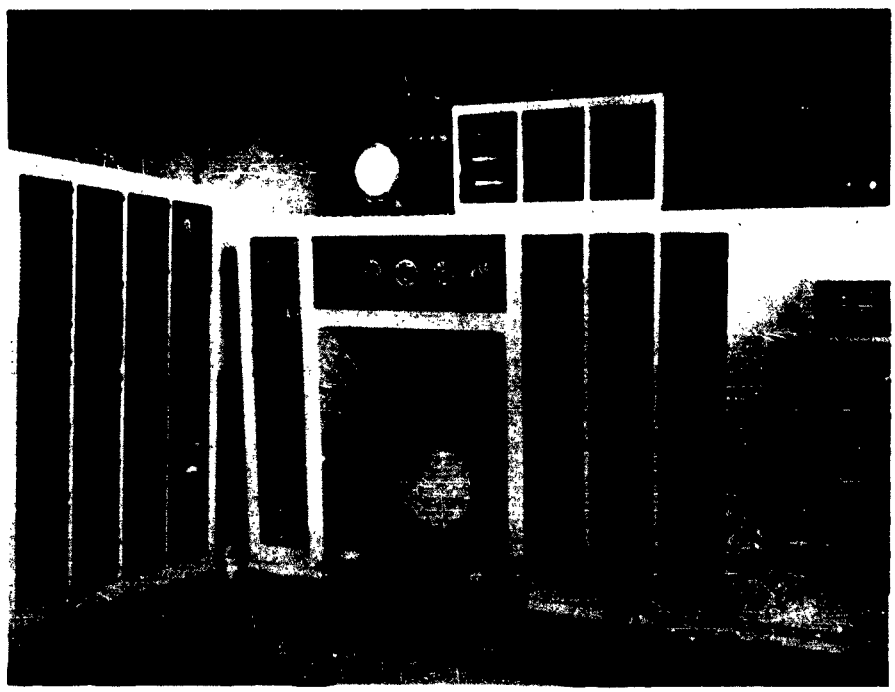


Figure 6. ASB-4 radar system. The student's console is visible at right.

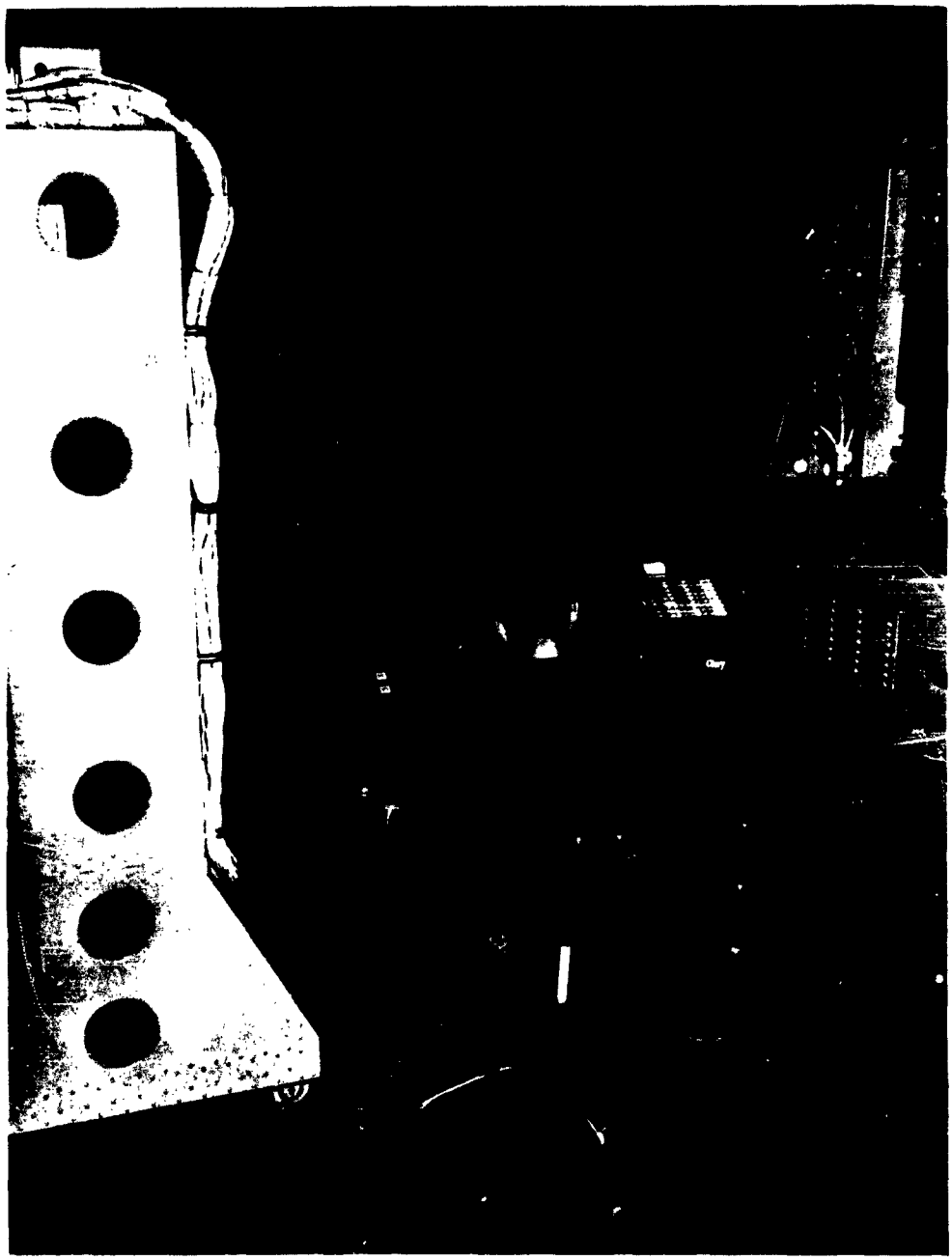
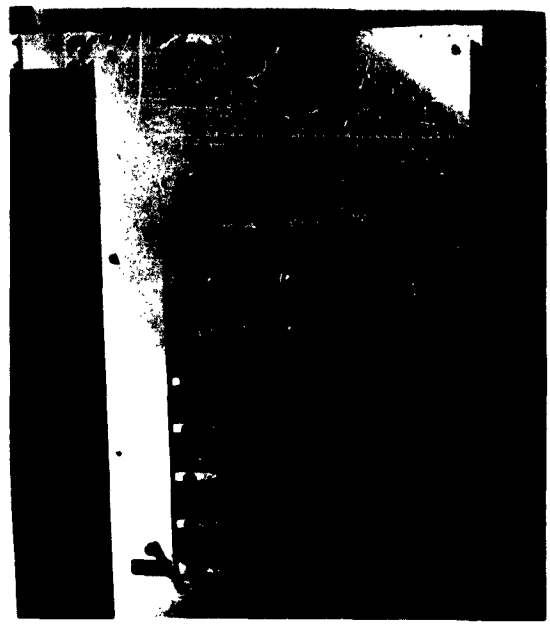


Figure 7. Subject learning to turn on and check out the ASB-4 radar.

Figure 8

Close up of student's console. Instructional material is presented to the student here. Stimulus material is presented in the large window at the top. Subject chooses the appropriate response from the smaller windows.



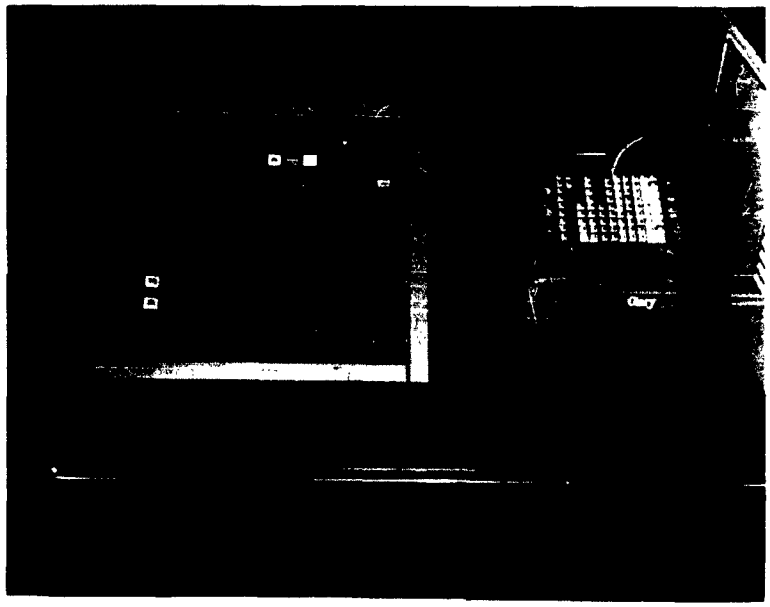


Figure 9. Experimenter's station showing the time-data recorder. The subject's responses and various time scores are printed out on the Clary printer for later analysis.

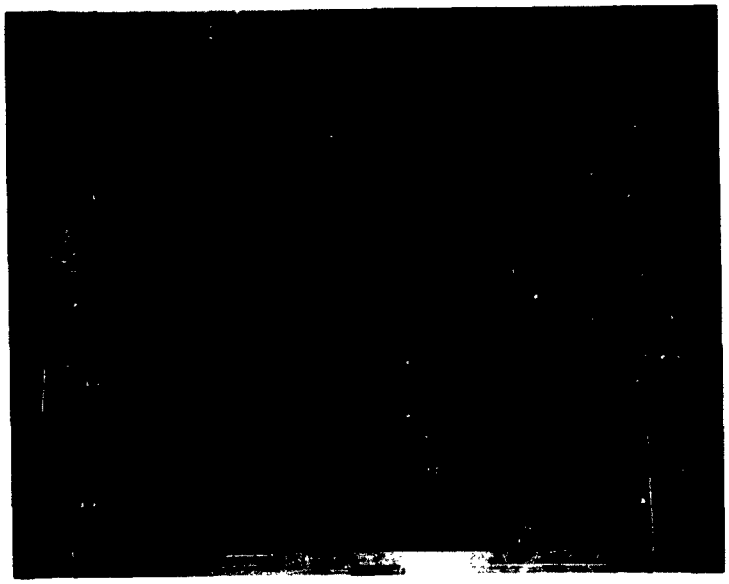


Figure 10

Experimenter's console. By pressing the appropriate buttons, the experimenter programs the student console and selects the conditions of learning for the subject.

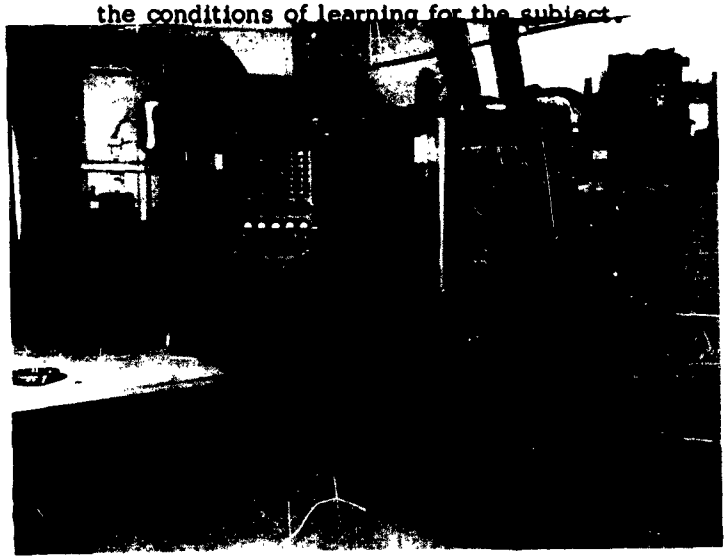


Figure 11

AN/APQ-T-1 Trainer. This equipment plus the interconnecting equipment in figure 12 simulates the aircraft environment.

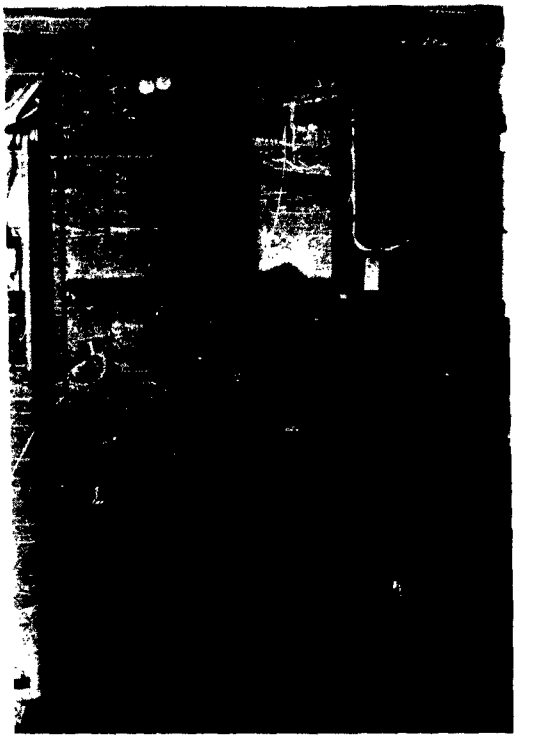


Figure 12 (right)

Interconnecting equipment required to simulate the aircraft environment.

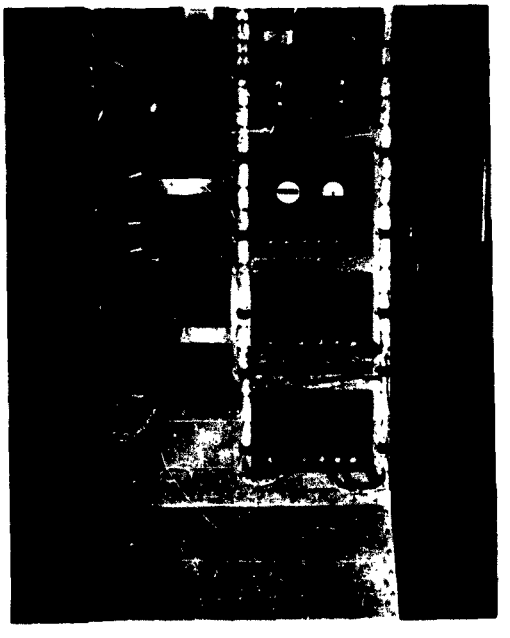


Figure 13 (left)

Power supply rack for the ASB-4

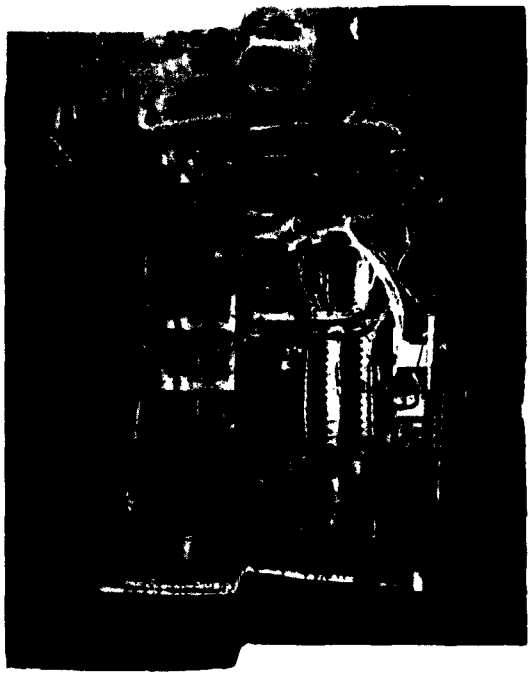


Figure 14

Inside view of the contral unit for the student console and experimenter's station.

Figure 15. ASB-4 computer racks. Radar data is processed by these computers.